

## GUN ALIGNMENT PROCEDURE

### FOR BULLET MARK MODEL B 1

1. With each gun aimed at the top left mechanical extreme, verify that the positioning pots (two beneath each gun) are set for 200 ohms minimum, 800 ohms maximum. This setting assures:

- (a) That the pots are safely away from the mechanical stop, and will not be damaged by gun movement, and
- (b) That a usable DC bias is supplied to the base of the driver transistors.

Make the resistance measurement between wiper-and-high side, not wiper to ground. Be sure power is off for this measurement.

2. With the "Bullet-Switch" in the test position, aim the left gun in any position which places the visible bullet mark at the approximate center of the TV Screen.
3. Slowly change the gun aim towards the left third of the TV screen, while simultaneously adjusting VR1 located on PC Board 94360-P to achieve good tracking of the Bullet Mark.
4. Now slowly change the gun aim towards the right third of the screen, while adjusting VR5 to achieve good tracking on the right side.
5. Repeat steps 3 and 4 several times, while increasing the amount of gun movement with each horizontal pass. Note that the interaction between left and right pots decreases with each pass, and that the overall aim becomes better. On the passes, it is best to adjust VR1 only when the Bullet Mark is off-center right. Avoid adjusting either VR1 or VR5 when the bullet mark is centered.
6. Also note that the aim is excellent for 80% of the left-right movement, but is somewhat non-linear at the edges. Two adjustment choices are available:

A. Full-Screen Coverage (Preferred)

Adjust VR1 such that the bulletmark is somewhat left of true aim, for left side aiming.

Adjust VR5 such that the bulletmark is somewhat right of true aim, for extreme right side aiming.

B. 80% Coverage

Adjust VR1 and VR5 such that the bulletmark does not completely reach the edges of the screen, even when gun is full left or full right. Note that the aiming error is smallest when the bulletmark range is reduced.

Experience indicates that the full-screen edge errors (Choice 'A') may actually enhance, not detract from, player enjoyment. In effect, these errors offset lack of quickness by the player when tracking moving targets during game play.

7. Adjust the top-bottom aim of the left gun in the same manner, using VR2 when the gun is aimed upward, and VR6 when the aim is downward.

Again note that a compromise may be made between aiming accuracy and range. It is best to adjust the bulletmark to be slightly above true aim when the aim is upward, and slightly below true aim when the aim is downward.

8. Adjust the right gun up & down, using VR4 and VR8.
9. Check aiming errors in the corners (max error), and at a point slightly below and right of center (where the aim should be almost "dead-on").